Introduction of the Brightness Program and the First Phase Plan

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Chapter 1 Background

1.1 Rural Energy Supply and Renewable Energy

Rural energy supply and new energy development is a very important sector of Chinas energy construction. In line with the fast development in many areas in China, the sector of rural energy supply and new energy development could be boosted. Yearly average rural energy consumption has been nearly doubled in the time from 1980 to 1998 from 412.2 kgce/a to 760 kgce/a. In the same time the annual electricity consumption per capita in the rural sector has nearly increased 10 fold from 7.9 kWh/a to 80 kWh/a.

However, it has to be recognized that annual energy consumption in the rural areas has just reached 760 Kgce/person/year which represents the very basic demand for living; according to international standards the minimal energy availability should be at least 1600 Kgce/person/year. With this figure the calculated total rural energy requirement would be 1,400 Bio. kgce/year. This figure is more than the total energy consumption of China in 1995. To find a suitable and sustainable solution for the energy development in rural China is a big challenge for the state and the energy industry.

Despite the immense economic development in many parts of China, there are still areas where electricity supply from the grid has not reached. Around 76.56 Mio. People, many of them in the 16 counties, 828 townships, and 29,783 villages, do not have access to electricity at all or they only have a limited supply by using batteries or small petrol or diesel generators. These counties, townships, villages and millions of scattered families are living in remote areas, far away from electricity grid and their present electricity consumption might be to little to extend the grid economically. And this situation might not change for the next 20 years.

To scope with the above mentioned challenges ii is necessary to develop and disseminate renewable energy technologies, especially to supply the country side with electricity. In fact, it is probably the only way for Chinese rural sector to have a supply through renewable energies. The earlier the activities will start, the better this will be for the development as well as the environment of the rural areas.

1.2 Wind and Solar Resources of China

1.2.1 Solar Resource of China

The solar resource is normally indicated by solar irradiation which is mainly influenced by clouds, latitude and altitude. In accordance with theoretical calculation, the maximum

solar irradiation occurs at high land of Tibet, it is 10,100 MJ/m*m. Year (2,807 kWh/ m*m. Year); however the minimum is at Sichuan basin, which is only about 3,300 MJ/ m*m. Year (917 kWh/ m*m. Year) . See the distribution map for the details. It is classified as 4 levels:

Table 1. Solar Energy Classification

Classification	A (high)	B (moderate)	C (marginal)	D (poor)
Annual global radiation (MJ/ m*m)	≥5850	5000 - 5850	4150 - 5000	≤4150
Annual sunshine duration (hours)	≥3000	2400 - 3000	1000 - 2400	≤1000

The total area of A+B is about 2/3 of the total area of china.

1.2.2 **Wind Resources of China**

Wind resource is normally indicated by wind power density and effective time.
The wind speed on 10 meter height is taken for the theoretical calculation in China. A turbulence factor and area of blades of wind turbine are taken into consideration for the calculation. The result of the calculation shows 253 million kW of the potential wind power in China. It is also classified 4 levels.

The wind energy distribution map shows 2 areas with very good wind energy resource. One is alone the Northeast- the North- the Northwest; an other one is along the coast. The both are with power density more than 200 W/ m*m, in some regions even reach 500 – 700 W/ m*m. The annual effective wind duration is more than 5000 hours, some even more than 7000 hours.

Table 2. Wind Energy Classification

Classification	A (high)	B (moderate)	C (marginal)	D (poor)
Annual effective wind power density (MJ/ m*m)	≥5850	5000 - 5850	4150 - 5000	≤4150
Annual effective wind hours (≥3 m/s)	≥5000	4000 - 5000	2000 - 4000	≤2000

The percentage of A is about 8% of the total area of China ; others are respectively:
B: 18%, C: 50%, D: 24%.

1.3 Review of Off-grid Power Systems using Wind- and PV-Technologies

Demonstrations and many years of practical experience show that off grid wind- and PV technologies are feasible to be used in provinces of Inner Mongolia, Gansu, Xinjiang, Qinghai, Tibet and some others as well as islands along coast. Since the 1970s 50W-100W home wind-chargers have been disseminated in large scale in Inner Mongolia. Till now around 150,000 sets of wind-chargers have been installed in the autonomous region. In the 1990s many Wind/Diesel/Battery, PV/Diesel/Battery and hybrid-home-systems were installed in Inner Mongolia. A 100 KW PV system was installed in Tibet.
The conclusion out of this is obvious: **Under present condition it is feasible to supply remote areas by use of wind and/or solar technologies. It is in line with the policy of sustainable development, and the economic and ecological advantages of using renewable energy in comparison with grid extension or the use of diesel gen-set have been demonstrated and documented.**

1.4 "Brightness Program" of China

As the major result of the World Solar Energy Summit of 1996 at Jimbabuwei the participants agreed on implementing the "Brightness Program" worldwide. The Chinese government immediately took up this idea and drafted its national "Brightness Program". In order to improve the living condition of the people in remote areas, following the principals of the Poverty Elevation Meeting of the Central Government and positive acceptance of the international community, the State Development Planning Commission formulated the "Brightness Program of China".

It is planned that 23 million people in remote area shall be electrified by wind and PV technologies till 2010; 100 W power capacity per capita shall be installed, which will be 1/3 of average power consumption of the people at that time. Meanwhile the frontier stations, relay stations, road service stations, maintenance stations of oil pipe line, signal stations of railway in the remote areas shall also be supplied.

Chapter 2 Rationale of the Brightness Program

To ensure the success of the program, it is necessary investigate the existing situation and conditions in areas not covered by grid.

2.1 Challenges and Problems

The program is facing mainly 4 challenges or problems:

(1) Finance
Till today there is no official finance channel for remote electrification. This problem shall be solved within the "Brightness Program". However, it remains a great challenge to invest about 2 Billion Yuan/Year.

(2) Quality and Affordability
The target of the the program is to supply millions of individual with high quality and thus reliable systems, and make this systems available at bearable cost.

(3) Sales- and Service-Network
The program needs a well organized sales and service network with established information and marketing channels. At present this network is not established.

(4) Education of the User
The 23 million user with little education and low technical understanding have to be informed to use the systems properly.

2.2 Distribution of not Electrified Population, Beneficiaries and Adaptable Technologies

2.2.1 Distribution of Not Electrified Population

Table 3 Distribution of Not Electrified Population

Province	Village	Household
Gansu	1,946	696,718
Qinghai	774	100,000
Inner Mongolia	1,383	535,608
Tibet	7,446	454,200
Xinjiang	1,732	300,416
Other Provinces		
Northern China	911	176,865
Northeast China	687	28,358
Eastern China	11,560	756,122
Middle & Southern China	35,103	2,102,523
Southwest China	53,410	3,174,325
Northwest China	9,620	566,451
TOTAL	124,572	8,891,586

2.2.2 Beneficiaries and Characteristics

- Herdsman and Fisherman families on grassland, mountain, islands
  - Living in remote areas, far away from each other, inconvenient communication
  - Certain payment ability
  - Urgent need of power supply
  - Level of technology and civilization is low
  - Many are minorities
  - Service condition is poor

- Microwave station, boarder station, road maintenance post, oil pipeline
  - In remote areas, far away from each other, inconvenient communication
  - Urgent need of power supply
  - Payment ability is good
  - Technicians for maintenance and repair available

2.2.3 Adaptable Technologies

- Wind and PV technologies and components are of high-quality and reliability
- Various systems shall be used within the program to satisfy different requirements as well as to fit to different areas with different resources
- Battery and Inverter (if not DC appliances) are necessary
- Hardware should be convenient for transportation, installation, maintenance and repair
- The systems must have high reliability, long lifetime and good performance.

2.3 Electricity Requirement and Basic System Match

Explanation:

Following basic system layouts are designed to satisfy various electricity requirements according to feature of wind and solar resources in the remote areas and are based on practical experiences. In fact, the system layout and

adaptation to local demand has to remain flexible. The purpose of listing the basic systems is only for investment estimation.

There are 2 kinds of target groups : individuals and groups of individuals. The basic systems are listed as follows to satisfy various electricity requirement in accordance to the wind / solar resources in the remote areas.

2.3.1 Individual Households

There are 3 levels of consumption: high, middle and low. The consumption of each group is estimated .

Table 4. Consumption Estimation of Individuals

Level	Appliance	Number	Power [W]	Time [h]	Simultaneous Factor	Peak Power [W]	Consumption [KWh]
Low	E.S. Bulb	2	9	5	0.8	14.4	0.072
	Tape Record	1	10	3	1.0	10.0	0.030
	Sum					24.4	0.102
Middle	E.S. Bulb	3	9	5	0.8	21.6	0.108
	B&W TV	1	30	4	1.0	30.0	0.120
	Tape Record	1	10	3	1.0	10.0	0.030
	sum					61.6	0.258
High	E.S. Bulb	5	9	5	0.8	36.0	0.180
	Color TV	1	70	5	1.0	70.0	0.350
	Tape Record	1	20	3	1.0	20.0	0.060
	Washing Machine	1	280	1	1.0	280.0	0.280
	Deep Freezer	1	120	8	1.0	120.0	0.960
	SUM					**526.0**	**1.830**

China is able to provide wind, PV and wind/PV hybrid home systems now. As wind home system cost is around 15 Yuan / W, PV home system cost is around 80 Yuan / W and the hybrid cost is around 30 Yuan / W, wherever average wind speed is more than 4.5 m/s, the wind home system is normally a better selection from economical point of view. PV home system works reliably without moving parts and is easy to be installed and convenient to be carried . It could be used in areas with more than 2000 hours yearly sun shine time. The hybrid home systems are good for high consumption households who requires higher reliability and more electricity. The system shall be selected in accordance with local wind and solar resources as well as electricity demands of the users.

2.3.2 Isolated Grid

2.3.2.1 Village

Estimation of the daily consumption of around 50 to150 households, equal to 200 to 600 people.

Table 5. Estimation of Daily Consumption of Villages

Appliances	Number	Power [W]	Time [h]	Simultaneous Factor	Peak Power [W]	Consumption [KWh]
E.S. Bulb	600	11	5	0.6	3,960	19.8
TV	80	70	4	0.8	4,480	17.9
Tape Record	100	15	2	0.6	900	1.8
Washing Machine	20	280	1	0.3	1,680	1.7
Deep Freezer	15	120	8	1.0	1,800	14.4
Drilling Machine	1	800	1	1.0	800	0.8
Welder	1	1,000	1	1.0	1,000	1.0
Others	1	3,000	2	0.8	2,400	4.8
SUM					**17,020**	**62.2**

2.3.2.2 Stationary Systems

The stationary means border station, microwave relay station, meteorological station, road maintenance station etc.. Estimation of the consumption:

Table 6 Estimation of Station Consumption

Appliances	Number	Power [W]	Time [h]	Simultaneous Factor	Peak Power [kW]	Consumption [kWh/d]
E.S. Bulb	50	11	5	0.8	0.44	2.20
TV	3	70	5	0.8	0.17	0.84
Transmitter	1	300	24	1.0	0.30	7.20
Washing Machine	1	280	1	0.5	0.14	0.14
Deep Freezer	2	120	8	0.7	0.17	1.34
Water Pump	1	1000	2	1.0	1.00	2.00
Welder	1	1000	2	1.0	1.00	2.00
Others	1	3000	1	1.0	3.00	3.00
Sum					**6.22**	**18.72**

2.4 Basic Systems for the Brightness Program

Table 7. Overview about systems used in Brightness Program

System	Description	User	Daily output [kWh]
L1	20-25Wp PV	Low Consumption Individual	0.07
L2	100W Wind Charger	Good wind/ Low Consumption Individual	0.2
M1	50-100Wp PV	Middle Consumption Individual	0.25
M2	300W Wind Charger	Good wind/ Middle Consumption Individual	0.7
H1	Hybrid Home System	Good wind/high Consumption Individual	1.3
H2	300-600Wp PV	High consumption individual	1.7
V1	2*5KW W/D/B	Good wind/remote village	60
V2	3-8KW PV/D/B	Remote village	40
S1	1*5KW W/D/B	Good wind/ remote station	30
S2	2-3KW PV/D/B	Remote Station	15

Chapter 3 Prices of Systems and the Main Components:

The present prices and foreseen prices used in this first plan for the “Brightness Program” are listed as follows. It should be explained that the market of wind charger and PV home systems are not in good order. Some of the products have no certificates, which means that the quality of the products is not satisfying. The prices are also vary quite a lot because of different quality, different scale of production and different selling channels. However, the “Brightness Program” shall reform and improve the industry and will offer a great order for the industry (about 600,000 Home Systems/year). It can be estimated that 30% of production cost and 50% of service cost can be reduced.

3.1 Prices of Home Systems

Table 8. Prices of Home Systems

Sys.	Description	P. Price [□/W]	Sel. Cost [□/W]	Sum [□/W]	B.P. Price [□/W]	Sel. Cost [□/W]	Sum [□/W]	Reduction [%]
L1	20-25Wp PV	90-100	5--10	95-110	60-70	3-5	63-75	30
L2	100-200W Wind	13-15	2--3	15-18	10-13	1.5-2.5	12-15	20
M1	80Wp PV	75-85	5	80-90	55-65	3	58-68	23
M2	300W Wind	11-13	3	14-16	9-11	2	11-13	21
H1	300W/100Wp Hybrid	30-32	2	32-34	23-25	2	25-27	22
H2	500Wp PV	80	2	82	64	2	66	18

3.2 Prices of Village Systems

Table 9. Prices of Village Systems and Main Components

System	Description	P. Price [T /kW]	B.P. Price [T /kW]	Reduction [%]	Installation [T /kW]	Sum [T /kW]
V1	**W/D/B**	40--50	23—35	35	9	34--44
V2	**PV/D/B**	70--80	55--65	22	9	64--74

3.3 Prices of Station Systems

Table 10. Price of Station Systems and Main Components

System	Description	P. Price [T /kW]	B.P. Price [T /kW]	Reduction [%]	Installation [T /kW]	Sum [T /kW]
V1	**W/D/B**	35--45	22--32	35	9	31--41
V2	**PV/D/B**	70--80	52--60	22	9	61--69

Chapter 4 The Plan for the First Phase of the "Brightness Program"

The "Brightness Program" is different from other normal construction projects; the beneficiaries live scattered in a vast area which is about 1/2 of the total area of China. In many cases the population density is less than 1 person/km^2. More than 6 million households which accommodate about 23 million people, around 2.65% of Chinas rural population, in more than 10 counties, 442 townships, and 120,000 villages and hundreds of boarder stations, microwave stations, and road services are considered in the project. In addition is the education and technical level of most individual households relatively low. On the other side are the wind and PV technologies high-tech. The payment capability of many individuals is limited and quite a few of them live under the poverty line. It is estimated that the total investment of the program shall be around 36 billion Yuan in **15 years.**

The "Brightness Program" is a high investment, big scale, large area, sustainable development project which aims at reducing poverty and will supply electricity in an environmentally friendly way.

4.1 Objective and Results

The Objective of the First Phase of the Projects is to supply about 8 million people, 2,000 villages, 100 boarder stations and 100 microwave stations for whom it is not viable to extend the power grid. In additions it is necessary to establish a solid foundation for the further development of the program.

To reach the objective following results shall be achieved:

Result 1: About 1.78 Mio. Home Systems, 2,000 Village Systems and 200 Station Systems are installed and in use.

Result 2: Financing channel of the central & local governments are installed, and a realistic financing mechanism is established and working.

Result 3: A system supply industry to provide satisfying hardware in high quality at reasonable price is set up.

Result 4: A complete and effective distribution and service network and marketing

mechanism are set up.

Result 5: A technical training system looking for different levels of training is installed to train local technicians and engineers.

4.2 Regional Plan and Measures for the First Phase of the Project

4.2.1 Preliminary Regional Plan

Table 11. Preliminary Plan for the First Phase of the Project

Area	Province	Village not Electrified	Households not Electrified	Village Systems	Home Systems
	Gansu	1,946	696,718	120	150,000
	Qinghai	774	100,000	50	15,000
	Inner Mongolia	1,383	535,608	120	100,000
	Tibet	7,446	454,200	100	80,000
	Xinjiang	1,732	300,416	120	100,000
	Other Provinces				
Northern China		911	176,865	170	80,000
	Hebei	245	12,286	50	30,000
	Shanxi	666	164,579	120	50,000
Northeast China		687	28,358	180	30,000
	Liaoning	155	7,774	80	10,000
	Jilin	0	0	0	0
	Heilongjiang	532	37732	100	10,000
Eastern China		11,560	756,122	400	400,000
	Shandong	0	0		
	Jiangsu	0	0		
	Zhejiang	285	17,122	100	30000
	Anhui	6,600	398,000	150	100,000
	Fujian	1,100	55,000	100	50,000
	Jiangxi	3,575	286,000	50	100,000
Middle & Southern China		35,103	2,102,523	360	510,000
	Henan	5,300	320,000	60	60,000
	Hubei	1,900	168,923	60	90,000
	Hunan	19,500	1,170,000	60	100,000
	Guangdong	2,333	140,000	100	70,000
	Hainan	6,070	303,578	60	80000
Southwest China		53,410	3,174,325	280	210,000
	Sichuan	19,670	1,170,000	60	50,000
	Chongqing	3,160	190,000	20	30,000
	Guizhou	3,280	164,325	50	30,000
	Yunnan	20,000	1,200,000	60	100,000
	Guangxi	7,300	440,000	90	100,000
Northwest		2,237	566,451	100	105,000
	Ningxia	1,090	54,501	20	5,000
	Shanxi	8,530	511,950	80	100,000
	TOTAL	**124,572**	**8,891,586**	**2,000**	**1,780,000**

4.2.2 Financial Scheme

The first phase is very important for the success of the overall program. The availability of projects found is essential for the execution. However it is not realistic to expect that the total investment (about 10 billion Yuan in total, 2 billion Yuan each year) will be contributed from state. In principle, **mainly the beneficiaries shall bear the expenses and the state will give necessary support and will assist in collecting money from various resources and will especially support the marketing.** The investment is planned in accordance with experience gained from demonstration projects and payment ability of end users.

Table 12. Project Investments

Investment for	Total	Payment of Users		Local Grants		Central Grants		Foreign grants	
		Money	Percentage	Money	Percentage	Money	Percentage	Money	Percentage
	Mio. Yuan	Mio. Yuan	[%]	Mio. Yuan	[%]	Mio. Yuan	[%]	Mio. Yuan	[%]
Distribution/service net	124			74	59.7%	20	16.1%	30	24.2%
High Consumption HS(20%)	4,545	4,294	94.5%	136.35	3.0%	0	0%	115	3%
Middle Consumption HS (45%)	3,520	3,176	90.2%	176	5.0%	52.8	1.5%	115	3%
Low Consumption HS (35%)	894	681	76.1%	71.52	8.0%	26.82	3%	115	13%
Village System	890	475	53.4%	200	22.5%	90	10%	125	14%
Station System	32	9	28.1%	8	25.0%	15	47%	0	**0%**
Total	**10,005**	**8,635**	**86.3%**	**666**	**6.66%**	**205**	**2%**	**500**	**5%**

As mentioned above, the total investment for the first phase of the projects is estimated to 10 billion Yuan, including 8.6 billion Yuan from users (86%); grants from local governments (666 Mio. Yuan; 6.7%) in yearly input of 50 Mio. Yuan. Grants from the central government are 205 Mio. Yuan (2%) with an yearly input of 51 Mio. Yuan. The village and station systems shall be subsidized through the grants for up to 72% respectivly 25% by local governments, and an additional 47% by the central government. The distribution and service network shall be fully financed by the grants, with 60% contribution from the local and the other 40% by the central government and international aid .

Financial policy and measures shall be:

- China should actively investigate in tapping financial resources. Special efforts should be put on multilateral and bilateral co-operation partners to attract grants or soft loans. The “Brightness Program” is of importance as it is utilizing renewable energy resources, aiming at reducing emission, and thus is sound to the environment. I aims at a sustainable development and supports poverty elevation. Many international partners e.g. foundations, organizations, governments, and companies are willing to assist in this kind of projects. China may get substantial support from the World Bank, Asian Development Bank, UNDP, European Union and countries like Netherlands, Japan, Germany, USA etc. as well as big international corporations, companies.

- Domestically we may collect grants and favorable loans from various channels: rural electrification, rural construction, poverty elevation, minority development funds to support the program.

- It is urgent to install a suitable mechanism for investing and circulating necessary funds, so as to reasonably arrange state grants & loan, local grants & loan and money collected from end users. Users should be capable to bear the price of the system. If the loans can be paid back in time the proprietors make reasonable profit and the program will run in a sustainable way.

- **The grants from state and local governments shall be mainly used to install the distribution and service network and the marketing mechanism. Quality of the systems must be guaranteed. Distribution and service must follow established regulations. The price for the system must be reasonable. Competition must be in order and controlled .**

It is suggested to arrange grants and loans as follows:

Table 13. Arrangement of Grants and Loans

	Resource	Amount [Mio. Yuan]	Share [%]	Annual Input [Mio. Yuan]
Grants	Foreign	500	36.47%	100
	State	205	14.95%	41
	Local	666	48.58%	133
	SUM	**1,371**		**274**
Loan	Foreign	1,000	17%	200
	Domestic	5,000	83%	1,000
	SUM	**6,000**		**1,200**

4.3 Improvement of Chinas Wind and PV industry

At present situation the strength of the main manufacturers of RE equipment in China is limited. Their financial capability is weak, production scale is small, and management level is lower than those in developed countries. The relation of quality to price has to be improved. It is necessary to improve Chinas Wind and PV industry to supply satisfying systems to the project. Fortunately, the program shall offer a very good chance and will help in developing a sustainable market for the industry. Already the first phase of the projects shall provide a 7.36 billion Yuan order for the equipment.

Table 14. Requirement and Value of the Main Components

Component	unit	quantity	unit price(T Yuan)	Value(Mio. Yuan)
PV module	KW	106,000	35 -38	4,000
Wind charger	KW	240,000	10 - 16	3,000
Charging controller	kVA	355,000	3.5 - 7.5	230
Inverter	kVA	231,000	0.1 - 7	320
Battery	mWh	2,200	650 - 700	1,500
Total				**9,050**

It can be seen from table 14 that the “Brightness Program” will provides a great market through orders from the industry. Mass production shall help to decrease production, distribution, and service cost dramatically (more than 20%). A complete and effective distribution and service network shall be installed through support of from the central

and local governments with a 132 million grant. Through this program end users will not only enjoy high quality and reliable power systems, but at the same time the service fee shall be reduced by about 50%. This will help so that more households shall be able to bear the cost. The mass production and effective distribution and service shall attract more investment to develop new technologies, so a further reduction of cost shall become possible and the market shall develop further. The program shall run in a sustainable way. Along with development of the local economy and the increase of household systems along with the environment awareness of the population the forecast for the market development of RE is very optimistic.

- When the first phase of the project will start, many powerful domestic and international companies will compete in the market.

- Mass production will attract new and high technologies to be applied in the industry to improve quality of the systems and reduce the production cost

- The program shall provide a good chance for domestic enterprises to learn advanced technologies and management from abroad.

- The mass production and big scale dissemination shall strengthen our industry and rise its technical level.

Measures to be taken

- To provide a fair competition condition it is essential that good and strong enterprises are supported. Our Wind and PV industry shall be formed by competition.

- Today there is no a effective quality assurance system in China. The quality standards are not complete and certification is not effective. It is very urgent to install a quality system from the beginning. All unqualified products and systems without certification should be removed from the market. All distributors and manufacturers have to provide quality assurance to the end users.

- The market has to be regulated to avoid chaos competition. The range of the system price shall be decided and controlled to ensure market development in sustainable way. It has to be pointed out that this is a special market. The “Brightness Program” reflects the consideration and assistance of the central government to minorities and poor people in remote area. Also big sum of grants are given. SDPC shall monitor the execution of the projects via “Brightness Program” office. The system supplier will be selected by bidding procedure and all equipment has to be certified .

- Dealers between manufacturer and end users shall be minimized. The range of cost and the profit at each link shall be regulated to ensure most favorable price for the end users. The equipment shall be procured in big scale by bidding procedure.

- Local distribution and service nets are going to be established under instruction and leadership of local governments and in accordance with local conditions. Participation of village governments is very important, and special attention has to be paid to this aspect. Their work shall be paid according to their contribution and achievements.

- Local proprietors shall make insurance for the systems to minimize risks due to accidents.

4.4 Establishment of Effective Distribution and Service Nets

Now wind and PV market is not in good order, the main problems are:

- There are no complete quality standards and service regulation yet.

- There are no complete and effective distribution and service nets yet. It is very difficult for the manufacturers to sale the systems and make service by themselves in remote areas. Herdsman often travel hundreds of miles for a small repairs or parts.

- The establishment of the net is essential for the success of the project.

- SDPC is going to formulate and issue quality standards and system installation and service regulation for the “Brightness Program”. All parties involved in the project have to follow the standards and the regulations.

- All of the proprietors in provinces must paiy attention to the establishing of the net which consist of linking points between central – province – county – village – end user. The state and local governments shall give grants to support the building of effective and smooth channels.

- The net is not only for the first phase of the project. I will contribute to the follow-up projects of the program.

- Insurance regulation shall be installed.

4.5 To carry out multilevel technical training

- Basic understanding about wind and PV shall be introduced via TV, broadcast, news paper, journals etc. to create awareness among the people.

- To train selected local personals from counties and villages, who are educated in high or middle school at least with background of electrical or mechanical work. After the training they may handle system installation, maintenance and simple trouble shooting and repair.

- To build up special working force within the provincial proprietor companies to form a back-bone technical team for the program. These engineers shall be able to master techniques of system layout, instructing system installation and commissioning, trouble shooting and training of local technicians.

- The Managing Office of the “Brightness Program” shall organize experts to draw up the training plan, compile training materials and conduct training courses.

4.6 Pilot Project shall be Carried Out First

It is necessary to carry out a pilot project prior to other projects of the program due to the complicated situation.

The pilot project must reach certain scale which is to electrify about 90% or more households in a short period in order to find out about problems which may occur and and find out which achievements can be reached. It is reasonable to install 5,000 to 7,000 systems for the pilot project.

The wind and solar resources should be rich in the project area where the local people should have certain experience and awareness about wind and PV technologies. To facilitate investigation and visit, the transportation and road condition should be good. It should be reached within 24 hours from Beijing by flight and car.

Special attention shall be paid to the implementing mechanism and the monitoring system during the pilot project. The experience shall be very valuable to "Brightness Program".

The pilot project is designed as follows:

Objective of the Proposed Project:

To Develop a Project Execution Mechanism and Monitoring System

Results of the pilot project will be:

Result 1. An effective quality guarantee system is developed and installed

Result 2. Scenario for setting up distribution net and regulations are developed

Result 3. Financial scheme of B.P. is developed and applied

Result 4. Monitoring System of B.P. is developed and installed

Result 5. Training System of B.P. is developed and installed

Result 6. Other appliances powered by RE system are introduced to the users

4.7 Planned Schedule for the "Brightness Program"

Table 15 Schedule of "Brightness Program"

Project / Year	1999	2000	2001	2002	2003	2004	2005--2010
Pilot	-----	-----	-----				
First phase		-----	-----	-----	-----	-----	
Second phase							----------

4.8 Significance of "Brightness Program" of China

Objective of the first project phase of the "Brightness Program" is to electrify about 8 Mio. People (about 1.78 Mio. Families), 2,000 villages and 200 stations in remote areas and were conventional means of supply (grid extension or generator) is not feasible. It has great significance to improve local living standard, develop local

economy and social affairs, strengthen unity of nationalities, consolidate border guarding. The program shall ensure a sustainable development of the areas.

The projects shall provide 261MWh/year of “Green Electricity”, in accordance with electricity consumption level of rural area in 1995 (50kWh/person*year), which is 0.6% of the total electricity consumption of rural areas of China in 1995. It shall save 156,000 T of coal (standard) and reduce emission as follows: 759 T of ash, 415,000 T of CO2, 5,928 T of NO2. The environment benefit is obvious.
It is estimated that the total investment for equipment plus service of the Brightness Program shall be about 10 billion Yuan; the investment will surely push the development of the wind and PV industry.

Table 16. Estimation of the Projects Investment

System	Percentage	Number [T sets]	Investment [Mio. Yuan	Percentage
Home System		1,780.0		
high consumption	20%	356.0	4,545.0	46.0%
middle consumption	45%	801.0	3,520.0	35.6%
low consumption	35%	623.0	894.0	9.0%
Village		2.0	890.0	9.0%
Station		0.2	31.8	0.3%
Sum			**9,880.8**	

The program shall also prompt development of other related industries like TV, households appliances, small home processing machines etc.. Counting with 2,000 Yuan/household, the sale of market items shall be 3.5 billion Yuan.

Chapter 5 Present Progress

5.1. Expert Team:
An expert team for the " Brightness Program" was established in March of 1999. The team office was installed at Beijing Jikedian Renewable Energy Development Center.

5.2 Plan for the First Phase of Brightness Program
The team made a great efforts for investigation, data collection and evaluation and worked out the plan for the first phase of the program. The brochures are ready to be presented to any institutions, manufacturers who are interested to participate the program.

5.3 Special Grant
A special grant for pilot projects of the program has been approved by SDPC. The purpose of the grant is to install a proper mechanism for the projects and prompt development of the program.

5.4 Xinjiang Brightness Project

Feasibility study of Xinjiang Brightness Project has been approved by SDPC. More than 70,000 solar home systems are going to be installed. Dutch government will donate $15 million to support the project. The working contract has been signed by Shell Solar International and Xinjiang Investment Company.

5.5 Brightness Projects in Inner Mongolia, Gansu and Tibert

Project proposal of Inner Mongolian Brightness Project has been approved by SDPC. The feasibility study is carried out now.
Project proposal for Gansu and Tibet are in approval procedure.

5.6 Standards

Test and evaluation standards of the Brightness Program for home and village systems have been drafted. The standards will be installed and issued after approval . The systems and components used by the program must pass test and certificate.

5.7 Test and Evaluation Center

A Test and Evaluation Center of China Academy of Sciences for PV and Wind Turbine Generator Systems was set up . A PV Test and Evaluation Laboratory was installed jointly by SDPC and NEDO, Japan. The lab. Is the most advanced one in China now. The center will serve for the "Brightness Program".

5.7 Training and Service Regulation

A training plan and regulation of service are in preparation by the expert team.